**SUMMARY**

Bryophyllum calycinum Salisb (Family - Crassulaceae) is an erect, succulent, glabrous, 0.3-1.2 m height, perennial herbs. It is also known as air plant, miracle leaf native to Madagascar. It is also known as “Agnigarbha’ (pregnant with fire) probably due to its property of producing. *Bryophyllum calycinum* plant are widely used in folk medicine and it is easily found in that countries for example- India, Tropical Africa, Madagascar, China, Australia, Pakistan, Hawaii, Tropical America. Its leaves, stems, roots and flowers portion that shows the chemical has high index in therapeutic value. Medicinal plants have been known for millennia and are extremely well-regarded all over the world as a prosperous resource of therapeutic agents for the anticipation of diseases and ailments. It conventional as an herbal remedy in approximately all parts of the world etc. This plant is widely grown in hot and humid areas, around the dwelling place, along road sides and herbal garden and field etc. The leaves and leaf juice of the plant were used like-antiviral, antipyretic, antimicrobial, anti-inflammatory, antitumor, hypcholesterolemic, antioxidant, diuretic, antiulcer, styptic, ant diabetic, astringent, antiseptic, antilithic and cough suppressant. The plant contained alkaloids, phenols, flavonoids, tannins, anthocyanins, glycosides, bufadienolides, saponins, coumarins, sitosterols, quinines, carotenoids, tocopherol and lectins. The previous pharmacological studies showed that it exerted many pharmacological effects including anticancer, antioxidant immunomodulating, antibacterial, anthelmentic, antiprotozoal, anti-inflammatory, analgesic, diuresis, antiurolithic, hepatoprotective, anti peptic ulcer, antidiabetic, wound healing activity and other pharmacological effects. The present review was designed to highlight the chemical constituents and pharmacological effects of *Bryophyllum calycinum*.

**KEYWORD**

*Bryophyllum calycinum,* Phytochemicals, Pharmacological Activity.

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Bryophyllum calcynium is a herbal plant and it use as medicinal plant. It belongs to crassulaceae family\(^1\). Bryophyllum calcynium have extensive concentration for their medicinal properties. Discover relevance in folk medicine, over and above in the contemporary medicine\(^2,3\). The plant Bryophyllum calcynium is frequently known as air plant, love plant, miracle leaf, life plant, Zakham-e-hyat, panfutti and Ghayamari, canterbutury bells, parnabijaetc\(^4,5\). It conventional as a herbal remedy in approximately all parts of the world\(^6,7,8\). This plant is widely grow in hot and humid areas, around the dwelling place, along road sides and herbal garden and field etc. Bryophyllum calcynium plant are widely used in folk medicine and it is easily found in that countries for example- India, Tropical Africa, Madagascar,China,Australia, pakistanHawai,Tropical America\(^9,10,11\). This usually medicinal plant (Bryophyllum calcynium) of leaves, stems, roots and flowers portion that shows the chemical has high index in therapeutic value. Medicinal plants have been known for millennia and are extremely well-regarded all over the world as a prosperous resource of therapeutic agents for the anticipation of diseases and ailments\(^12,13\). The leaves and leaf juice of the plant (Bryophyllum calcynium) were used like- antiviral, antipyretic, antimicrobial, anti-inflammatory, antitumor, hypocholesterolemic, antioxidant, diuretic, antilulcer, styptic, ant diabetic, astringent, antiseptic, antilithic and cough suppressant\(^14,15,16,17,18,19,20,21\).

**SYNONYM**

Bryophyllum pinnatum, Kalanchoe pinnata, Cotyledon pinnata, Crassula pinnata,bryophyllum calcynium\(^22\).

**English**- Air plant, Miracle leaf

**Hindi**- Jakh Me Hayat, Panfutti, Patherchart.

**Sanskrit**- Parnabija, Pashanabheta.

**Tamil**- Ranakalli.

**Bengali**- Koppata.

**Gujarati**- Ghaymaari.

**Malayalam**- Ellamurunga.

**Kingdom Planate**- plant\(^23,24,25\).

**Sub Kingdom**- Tracheobionta- Vascular plant.

**Division**- Magnoliphyta.

**Subdivision** - Magnoliophyta- flowering agent

**Class**- Magnoliopsido-Dicotyledone.

**Subclass**- Rosidae.

**Order**- Saxifragales.

**Family**- Crassulaceae.

**Genus**- Bryophyllum Kalanchoe.

**Species**- Bryophyllum , pinnatum Kurz.
PROPERTIES

Bryophyllum calcynium plant consider of anti infection, astringent, antiseptic, haemostatic, refrigerant, emollient, counterirritant mucilaginous, vulnerary, depurative, anti-inflammatory, disinfectant and tonic and antimicrobial activity. Pharmacologic studies of Bryophyllum calcynium plant have shown the pharmacologic properties for example- Immunomodulatory, CNS depressant, analgesic, anti-inflammatory, anti-allergic, anti anaphylactic, antileishmanial, antitumor us, antiulcer, antibacterial, antifungal, antiviral, febrifuge, gastro protective, immunosuppressive, insecticidal, sedative, muscle relaxant and antimicrobial activity etc.

DISTRIBUTION

Bryophyllum calcynium plant is found in that’s countries like Asia, Australia, New Zealand, West Indies, Macaroneia, Mascarones, Galapagos, Melanesia, Polynesia and Hawaii. In many of these, such as Hawaii, it is regarded as an invasive species.

It is also widely distributed in the Philippines and it is known as katakatoka or kataka-toka which is also an adjective meaning astonishing or remarkable.

MORPHOLOGY

Bryophyllum calcynium is used as Medicinal plant, ornamental and crassulencent herb. It is cultivation in houses, herbal garden, and field. The plant that grows all over the India in hot, humid and moist areas. The plant height is about 1-1.5m in long and it consist of opposite leaves and 10-20cm long glabrous leaves. The lower leaf is usually simple and upper one 3-7 foliate and are long-petioled. They are freshly dark green color and trimmed in reddish purple and Leaves blade are pinnately compound with 3-7 leaflets. Stem is hallowing four angled and usually branched, The flowers are 2-3 cm long and color of plant is reddish purple. Fruits are membranous follicles enclosed in the persistent papery calyx and corolla, seed smooth and ellipsoid. The session of Bryophyllum Calcynium plant flowers grow in November to March Fruit in April, it is astringent and sour in taste and sweet in the post digestive effect and it has hot potency.

Fig. 1: Whole Plant of Bryophyllum calcynium calcynium.

Fig. 2: Leaves of Bryophyllum.
Cattle Poisoning

A report of 2 adult cattle deaths attributed the fatalities to a large of amount of feeding of *Bryophyllum Calcynium* plants. The main autopsy findings were acute ruminates and reduction of bronchiolar lumens and emphysema. In common with other Crassulaceae (genera *Tylecodon*, *Cotyledon* and *Adromischus*), *Bryophyllum pinnatum* has been found to contain bufadienolide cardiac glycosides. These can cause cardiac poisoning, particularly in grazing animals. *Bryophyllum calcynium* has been testimony in Trinidad and Tobago as being used as a conventional treatment for hypertension.

**CHEMICAL CONSTITUENTS**

Phytochemical screenings of *Bryophyllum Calcynium* have yielded alkaloids, triterpenes, glycosides, flavonoids, steroids, butadienolides, lipids, and organic acids, Phenol and tennis, free amino acid and terpenoids. The *Bryophyllum Calcynium* Plants Yields of arachidic acid, astragal in, behenic acid, beta amyrin, benzenoids, bersaldegenin, beta-sit sterol, bryophollenone, bryophollone, bryophyllin, caffeic acid, ferulic acid, quercetin, steroids, taraxerol. Phytochemical evaluation of Plant extracts are yielded bryophyllum calcynium a potent cytotoxic bufadienolide orthoacetate. Bufadienolide has been reported to be poisonous and toxicity with digitalis-toxicity type cardiac effects (slowing of heart rate, heart blocks and potentially fatal ventricular arrhythmias for example bryotoxin A,B,C.Bryophillin A, a bufadienolide compounds and It has shown anti-tumor promoting activity. The Plant Leaves yielded malic acid and fractionation of an EtOAc extract yielded seven kaempferol rhamnosides: kaempferol 3-O-α-L-((2-acetyl)rhamnopyranoside-7-O-α-L-rhamnopyranoside, kaempferol 3-O-α-L-(3-acetyl)rhamnopyranoside-7-O-α-L-rhamnopyranoside, kaempferol 3-O-α-L-(4-acetyl)rhamnopyranoside-7-O-α-L-rhamnopyranoside, kaempferol 3-O-α-D-glucopyranoside-7-O-α-L-rhamnopyranoside, afzelin, and α-rhamnosorobin. Bryophyllum calcynium is contain Isocitric acid and citric acid. Phenols, Phenylpropanoids and Flavanoids for example like -Syringic acid, caffeic acid, 4-hydroxy-3-methoxy-cinnamic acid, 4-hydroxybenzoic acid, para-hydroxycinnamic acid, paracoumaric acid, ferulic acid, protocatechuic acid, phosphoenolpyruvate and protocatechuic acid. Triterpenoids and Steroids like α-amyrin, α-amyrinacetate, β-amyrin, β-amyrinacetate, bryophollenone, bryophollone, taraxerol, pseudo taraxasterol, 18-α-oleanane, friedelin and glutinol.

**Structures**

![Brophyllin](image1)

![Bryophyllol](image2)

![Bryophollone](image3)
PHARMACOLOGICAL STUDIES

Antimicrobial

The antimicrobial effects with plant extracts *Bryophyllum Calcynium* of pet ether, chloroform, ethanol extract and aqueous extracts was *in vitro* Agar cup plate method against the example- (Staphylococcus aureus, Escherichia coli, Pseudomonas aeruginosa and Candida albicans) shows significant anti microbial properties. Ethanol extract of plant *Bryophyllum Calcynium* was effective antibacterial activity compared to others and while not any or no one of extract showed the activity against the (C. albicans)\(^{38}\). The aqueous extract of plant *Bryophyllum Calcynium* is given the antimicrobial activity against the all tested microorganism\(^{39}\). Antimicrobial activity against Pseudomonas aeruginosa, Klebsiella pneumonia, E.coli, Staphylococcus aureus, Candida albicans and Aspergillus Niger\(^{40}\).

Antioxidant

The plant extracts are shown the antioxidant activity *Bryophyllum calycinum* plant extract used to perceive the antioxidant activity by using the both are DPPH and nitric oxide free radical scavenging process\(^{41}\).

Antihypertensive activity

The plant extracts specified the generally in the antihypertensive activity. The mainly abundant macro element Calcium was present in the plant extracts *Bryophyllum Calcynium*. The normal extracellular calcium concentrations are for all intents and purposes for blood coagulation and for the reliability, intracellular cement substances. The inferior sodium content of *Bryophyllum calycinum* may be an added the advantage because of the directly relationship of sodium gulp with hypertension on human being\(^{42}\). The effects of aqueous extract and ethanolic plant extracts were resolute on the arterial blood pressures and heart rates of the normal and unbidden hypertensive rats, using meddling and non-meddling method and both of the extracts formed dose related and considerably decreases in arterial blood pressures and heart rates of the anaesthetized normotensive and hypertensive rats. The hypotensive effects of the plant extracts were more conspicuous in the hypertensive and than in normotensive rats\(^{43,44}\).
Immunomodulatory activity

During the immunomodulatory activity animal extravaganceed daily with oral *Bryophyllum calcynium* during hyper sensitization with ovalbumin were protected against the death. Oral protection was accompany by the reduced production of OVA-specific IgE antibodies, reduced eosinophilia, impaired production of the IL-5, IL-10 and TNF- α cytokines. These find indicated that oral treatment with *Bryophyllum calcynium* effectively down modulates pro-anaphylactic reactions inducing immune responses. The aqueous extract of plant *Bryophyllum Calycniun* leaves causes appreciably inhibition of cell-mediated and hum oral immune responses in mice. The spleen cells of animals pretreated with plant extracts shown a decreased ability to proliferate in response to both mitogen and antigen in vitro as well as. The specific antibody responses to the ovalbumin were also appreciably reduced by treatment.

Anthelmintic and antiprotozoal activity

Anthelmintic activity of this plant extracts *Bryophyllum Calycniun* like chloroform, methanolic and aqueous extracts of the plant root caused paralysis and deaths of worms and showed important Anthelmintic activity. The flavonoids isolated from the plant was effective which indicated that the antileishmanial effect could due to flavonoid.

Anti-inflammatory and analgesic activity

The plant extract drastically inhibited fresh egg albumin-induced acute inflammation and drastically exhibited antinociceptive effects against the thermally- and chemically-induced nociceptive pain stimuli in mice. Stigmast-4, 20 (21), 23-trien-3-one, a steroidal derivative isolated from the leaves extract of the plant *Bryophyllum Calycniun* and also infatuated anti-inflammatory effect. The aqueous extract of *Bryophyllum calycinum* plant extract were showed antinociceptive and anti-inflammatory and anti diabetic activity.

Gastrointestinal activity

The *Bryophyllum Calycniun* plant extract exhibited moderately the gastrointestinal effect activity. The methanol-soluble fraction of the plant extracts inhibited the development of a classes of acute ulcers induced in the stomach of rats and duodenum of rats and guinea pigs. Premedication tests in animals revealed that the extracts of plant possessed major protective action against the gastric lesions induced by aspirin, indomethacin, serotonin, reserpin, stress and ethanol. A significant protection with plant extract of *Bryophyllum calycinum* was occurred for aspirin-induced ulcer in pylorus-ligated rats and for histamine-induced duodenal laceration in guinea pigs. A significant enhancement or increasing of the healing process was also occurred in acetic acid-induced chronic gastric lesions in rats.

Cardiovascular activity

Decreased arterial blood pressures and heart rates of anaesthetized normotensive and hypertensive rats by using the aqueous extract and methanolic plant extracts of *Bryophyllum Calycniun*. The effects of aqueous extracts and methanolic plant extracts of the herb were find out on arterial blood pressures and heart rates of normal (normotensive) and on impulse hypertensive rats and using invasive and non-invasive techniques. The aqueous extract and methanolic plant extract (50-800 mg/kg iv or ip) construct dose-related, significantly decreases or low in arterial blood pressures and heart rates of anaesthetized normotensive
(normal) and hypertensive rats. The hypotensive effects of the plant extracts were more pronounced in the hypertensive than in normotensive rats. The plant extracts of *Bryophyllum Calcynium* (0.25 - 5.0 mg/ml) also produced dose-dependent significantly reduced or decreased in the rate and force of contractions of guinea-pig isolated atrial and inhibited aggravated electrical field stimulation (ES-provoked) and as well as potassium and receptor-mediated agonist drugs-induced contractions of the rat isolated thoracic aortic strips in a non-specific comportment. The inhibitory effects of the plant extracts *Bryophyllum Calcynium* given away on the cardiovascular system of the laboratory animals were opposed to physiological doses of the standard antagonist drugs.

**Anti diabetic activity**

The anti diabetic activity is carried out by *Bryophyllum Calcynium* plant extracts. The plant aqueous extract of *Bryophyllum calcynium* caused significant reductions or reduce in the level of blood glucose fasted normal and fasted streptozotocin –treated diabetic rats.

**Antihistaminic effect**

The methanol extract of the *Bryophyllum Calcynium* has also been reported to have histamine receptor (H1) antagonism in the ileum, peripheral vasculature and bronchial muscle.

**Anti diarrheal**

Study evaluated the anti diarrheal prospective of *Bryophyllum calcynium* against a number of experimental models of diarrhea in albino Wistar rats. The aqueous extracts of leaves given the significant anti diarrheal activity against castor oil-induced diarrhea and castor oil-induced enter pooling, together with reduction in gastrointestinal motility.

**Neurosedative / Muscle Relaxant**

Study in mice investigating the neuropharmacological activities of a saline leaf extract of *Bryophyllum Calcinum* shown the dose-dependent persistence of onset and duration of pentobarbitone-induced hypnosis. It also postponed onset to convulsion in strychnine- and picrotoxin-induced seizures with minimal protection against picrotoxicin seizures.

**Neuropharmacological activities**

*Bryophyllum Calcynium* aqueous leaves extract acquires depressant action on CNS. The animals treated with 50 -200mg/kg was found to produce quite significant decrease in loco motor’s activity in dose dependent method, with no ptosis at these doses and, climbing and inclined screen tests. There was a momentous loss of bringing together and decrease or reduce muscle tone in animals treated intraperitoneally with aqueous extract in a dose dependent fashion. The result indicates significant alterations in general behavior pattern, reduction in spontaneous mortality, potentiating of pentobarbitone induced sleeping time in a dose dependent fashion. The anticonvulsant effect of the aqueous leaves extract observed decrease or no effect compare to methanolic extract. The methanolic fraction possesses a potent CNS depressant action. It is possible therefore that the inhibitory effect of methanolic extract on CNS activities may be due to effect of methanol and partly to the constituent of *Bryophyllum calcynium* with its attendant higher dose.
Uterine Contractility

*Bryophyllum calcynium* increased contraction frequency by 91% at constant amplitude and inhibited oxytocin stimulated contractions by 20% at constant amplitude with slightly decreased frequency. Fenoterol decreased contraction by 50% with a significant decrease in frequency. *Bryophyllum calcynium* is more effective and has less side effects than the traditional labor inhibitors in preventing preterm delivery and tolerability and tocolytic effects between the i.v. infused plant extract and beta-agonists. In a retrospective study, 67 pairs of pregnant women in preterm labor treated with i.v. *Bryophyllum calcynium* or beta-agonists were closely matched for maternal age and gestational age at tocolysis, CTG recorded contractions, cervical effacement, preterm premature rupture of the membranes and history of preterm labor. Results shows that the pregnant women with plant extracts and beta-agonists were equal in the prolongation of pregnancy (6.2 versus 5.4 days, NS), the gestational age at delivery (38.0 versus 37.1 weeks, NS) and the duration of hospitalizations, but had less adverse effects (34.3 versus 55.2% with palpitation or dyspnea). The neonatal outcome and morbidity in the *Bryophyllum calcynium* group were equal or better. Therefore concluded in the management of the preterm labor herb is no less effective than beta-agonists, but is significantly better tolerated. The plant should not be used during the pregnancy. It has traditionally been used during childbirth and may stimulate the uterus. Also because of immune modulating actions and it should not be used the chronically for long periods of time or by those with a lowered immune system.

Insecticidal, Fungi toxic and Phytotoxic activity

The isolated bufadienolides: bryophyllin A and bryophyllin C from *Bryophyllum calcynium* and showed strong insecticidal activity against third instarlarvae of the silkworm. The fungi toxic and phytotoxic effects of extracts on the fungal pathogens inducing wilting on cowpea grown in Ago-Iwoye, South Western Nigeria. The plant extracts reduces the Disease Infection Rate (DIR) in treated plants. *Sclerotium rolfsii* sacc induced wilting of between 4 and 12% on cowpea seedlings treated with plant extracts under field conditions while about 39.6% incidence of cowpea seedlings wilting was observed under control experiment on the same experimental plot. The plant extracts increased significantly the plant height, shelf life, relative water content and chlorophyll contents of the cowpea seedlings during both the wet and dry season. On the other hand, the plant extracts significantly reduced transpiration rate and stomata aperture of treated plant in both seasons.

Anti fungal activity

The plants against the different strains of these species for example - (*Canadida albicans, C.glabrata, C. tropicalis, C. pseudotropicalis*) shows good antifungal activity. They bring to a close or wrap up that none off strains of *C. Pseudotropicalis* inhibited by ethanolic extract of *Bryophyllum calcynium*.

Contraindications

The extracts were found to be non-toxic orally in doses up to 3 g/kg body weight in mice and rats. There was no death at a maximum acute dose of 5 g kg/ body weight by the oral route. Sub acute treatment did not significantly alter animal weights, organ-to-body weight ratios, fluid intake, hematological indices and the levels of AST, ALP and albumin. ALT level was significantly reduced in the treated group. Total bilirubin and conjugated bilirubin levels were not significantly altered in the treated group.
Bryophyllum pinnatum plants are used as a folkloric medicine to heal wounds and treat infection. Bryophyllum is used for analgesic, anti-inflammatory, antibacterial, anti-ulcerous, antiviral and anti-allergic properties. It is also used to reduce fever and suppress the immune system and treat diarrhea, vomiting, heartburn, earaches, epilepsy, hypertension, diabetes, arthritis, upper respiratory infections and the flu. It is used as an insecticide, a muscle relaxant, an antihistamine and a sedative. The leaf juice is useful in cholera. The leaves roasted over fire are applied to places of wounds and surgical sutures in the skin to prevent discoloration of the skin.

CONCLUSION

Medicinal plants have been known for millennia and are extremely well-regarded all over the world as a prosperous resource of therapeutic agents for the anticipation of diseases and ailments. Through screening of literature available on *Bryophyllum calycinum* depicted the fact that it is a popular remedy among the various ethnic groups. Through screening of literature available on *Bryophyllum calycinum* depicted the fact that it is a popular remedy among the various ethnic groups. In Conclusion, researchers are exploring the therapeutic potential of this plant as it has more medicinal values which are not yet known.

REFERENCES


